MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2015/2016

PPC0116 – PRE-CALCULUS

(All Sections / Groups)

1 JUNE 2016
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 4 pages with 4 Questions only.
2. Attempt **ALL FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please print all your answers in the Answer Booklet provided.

Question 1

(a) A group of friends paid a total bill of RM287.50 for their meals at Kenny's Restaurant. The total included:

- the actual price of the meal,
- 10% service tax, and
- government tax that is half of the service tax.

What was the actual price of the meals before taxes were added?

[5 marks]

(b) If $y = 1 + 2i$ and $z = -2 - 3i$ are complex numbers, write each of the following expressions in standard form, $a + bi$.

(i) $y^2 + z^2$ [3 marks]

(ii) $\frac{y}{z}$ [3 marks]

(iii) $y - \bar{z}$ [2 marks]

(c) Solve the following equations and inequality:

(i) $|4x+3| = 3 - x$ [3 marks]

(ii) $3 = x + \sqrt{x-3}$ [4 marks]

(iii) $\frac{x+2}{x^2-3x-4} > 0$ [5 marks]

Continued...

Question 2

(a) Determine the radius and the centre coordinate of a circle with this equation:

$$x^2 + 8x + y^2 - 10y + 16 = 0$$

[7 marks]

(b) For the polynomial $f(x) = -\frac{1}{2}(x+4)(x-1)^3$,

(i) find its x-intercept(s) and y-intercept(s). [3 marks]

(ii) at each x-intercept, determine whether the graph of f crosses or touches the x-axis. [2 marks]

(iii) what is the maximum possible number of turning points of f?

[1 mark]

(iv) hence (or otherwise), sketch the graph of f. [4 marks]

(c) A piecewise-defined function $f(x)$ is defined as below,

$$f(x) = \begin{cases} -7, & -5 \le x < -2 \\ -x^2 + 4, & -2 \le x < 3 \\ x - 3, & 3 \le x < 6 \end{cases}$$

(i) graph the function $f(x)$, and, [6 marks]

(ii) if given $g(x) = x - 1$, find $(f/g)(4)$ [2 marks]

Continued...

Question 3

(a) Determine the composite function $g \circ f$, given that $f(x) = \frac{x+2}{x-3}$ and $g(x) = x^2 - 1$. Simplify your answer as much as possible.

[6 marks]

(b) Use the Factor Theorem to determine whether the function $f(x) = 4x^3 - 3x^2 + 5x - 6$ has the factor $x - 1$. Use synthetic division to verify.

[5 marks]

(c) If $(x+1)$ is a factor of $f(x) = 2x^3 + 7x^2 + kx - 3$, find the value of k. Subsequently, factorize $f(x)$ completely.

[7 marks]

(d) Find the partial fraction decomposition of

$$\frac{x+3}{(x+2)^2}$$

[7 marks]

Question 4

(a) Express the following series using sigma notation (do not calculate the sum):

$$3 + \frac{3^2}{2} + \frac{3^3}{3} + \ldots + \frac{3^{10}}{10}.$$

[3 marks]

(b) The eighth (8^{th}) term of an arithmetic sequence is 75, and the twentieth (20^{th}) term is 39.

(i) Evaluate the first term and the common difference. [4 marks]

(ii) What is the 30th term of the sequence? [4 marks]

(c) A tennis ball is dropped from a height of 25 meters. Each time it strikes the tennis court surface, it bounces up to 75% of the previous height.

(i) Calculate the height the ball bounces up to after it strikes the tennis court surface for the fifth time.

[4 marks]

(ii) Find the number of times the ball needs to strike the tennis court surface before its bounce becomes less than 2 meters. [5 marks]

(d) Expand $(2y - 3)^4$ using the Binomial Theorem.

[5 marks]

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